

SSC-SDE-3

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SOLENOIDAL DETECTOR NOTES

TRIGGER RATES AT SSC

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I. Hinchliffe

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This note contains a few cross sections at SSC energies. These are expressed in terms of trigger rates. All the information in this can be obtained by reading EHLQ or running a standard program such as ISAJET or PAPAGENO. It is trivial to make similar plots for other processes. I will consider processes that contain one or more leptons in the signal. First, consider the production of a $t\bar{t}$ pair. If the top quark is 120 GeV this rate is 20 nb. We may attempt to detect the top via its decay into a lepton + some jets where the lepton is isolated, *i.e.* it came from the W in $t \rightarrow bW$ and not from the decay of the b , and has transverse momentum greater than some p_0 . Figure 1 shows the fraction (A) of the cross section that is accepted as a function of the minimum p_0 of the detected lepton. Four lines are shown corresponding to lepton acceptances in rapidity of $|y| < 4.0, 3.0, 2.0$ and 1.0 . The total accepted rate is then $20 \times 2 \times BR(t \rightarrow l + X) \times A$ nanobarns.

An alternative strategy is to detect two isolated leptons, one from the t and one from the \bar{t} . The accepted cross section is now given by $20 \times BR^2(t \rightarrow l + X) \times A_1$. A_1 is shown as a function of p_0 in figure 2. In this case both leptons must have transverse momentum greater than p_0 and must be in the specified rapidity range.

In figure 3, I show the acceptance (A) for the four leptons arising from a Higgs of mass 500 GeV decaying to to a Z pair and hence to 4 charged leptons. All of the leptons are required to have transverse momentum greater than p_0 and rapidity in the ranges $|y| < 4.0, 3.0, 2.0$ and 1.0 . The total observed rate is given by $6 \times BR^2(Z \rightarrow l^+ l^-) \times A$ picobarns. This rate depends on the top mass, see EHLQ for more info.

The following processes may be relevant for estimating how many background events pass the trigger. Figure 4 shows the total rate for a hadronic cluster (jet) of transverse momentum greater than p_0 and rapidity in the range $|y| < 4.0, 3.0, 2.0$ and 1.0 . Figure 5 shows the rate for an isolated photon (the dominant source of electromagnetic clusters). Finally figure 6 shows the rate of

isolated single leptons of positive charge. (By isolated, I mean not more than 10GeV of hadronic energy within $\Delta R = 0.7$ of the lepton.) These arise almost exclusively from $W + jet(s)$ and $Z + jet(s)$ final states. There is some small contribution from b and c decays. The rate from these latter sources may not be small if the leptons are not isolated.

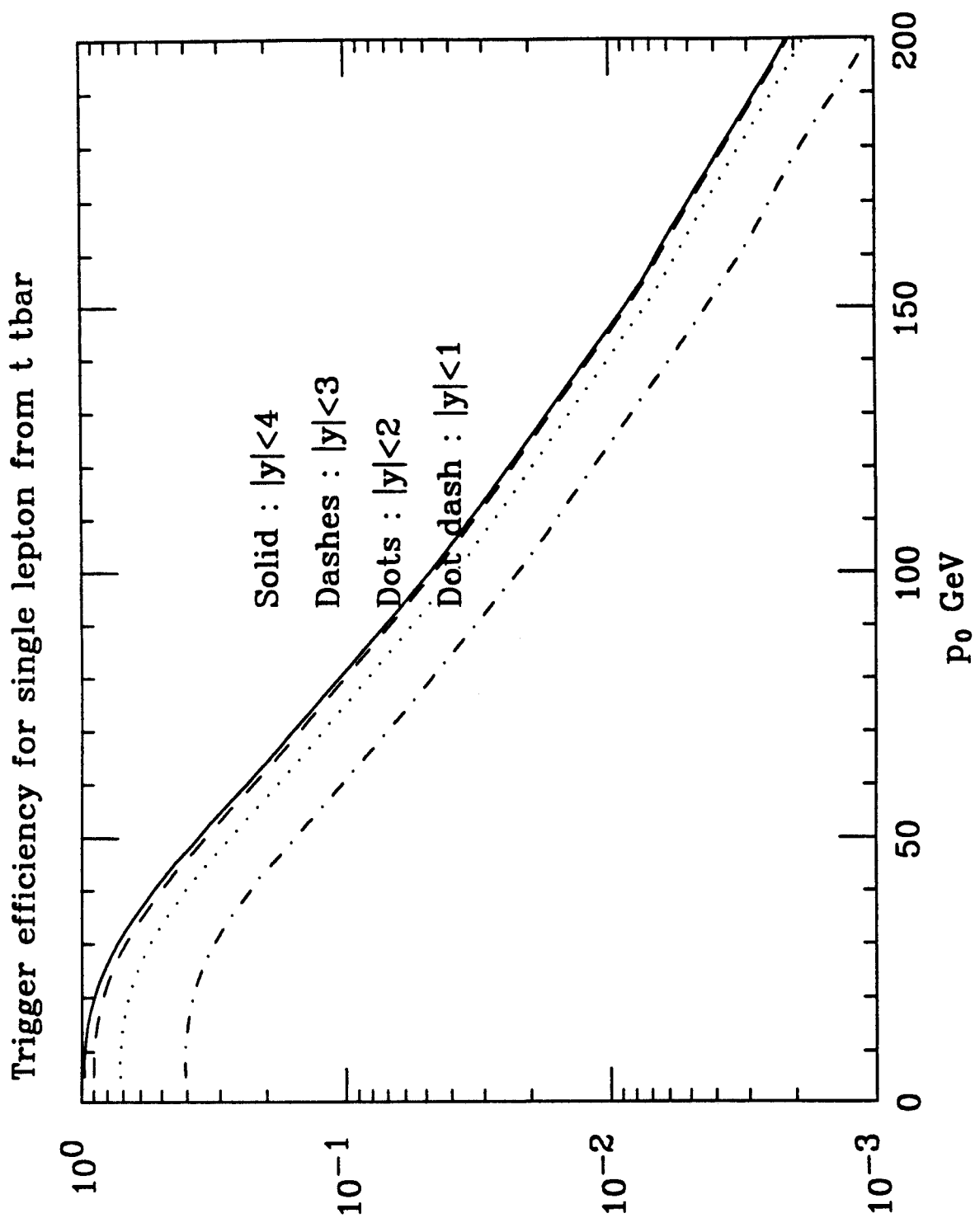


Figure 1

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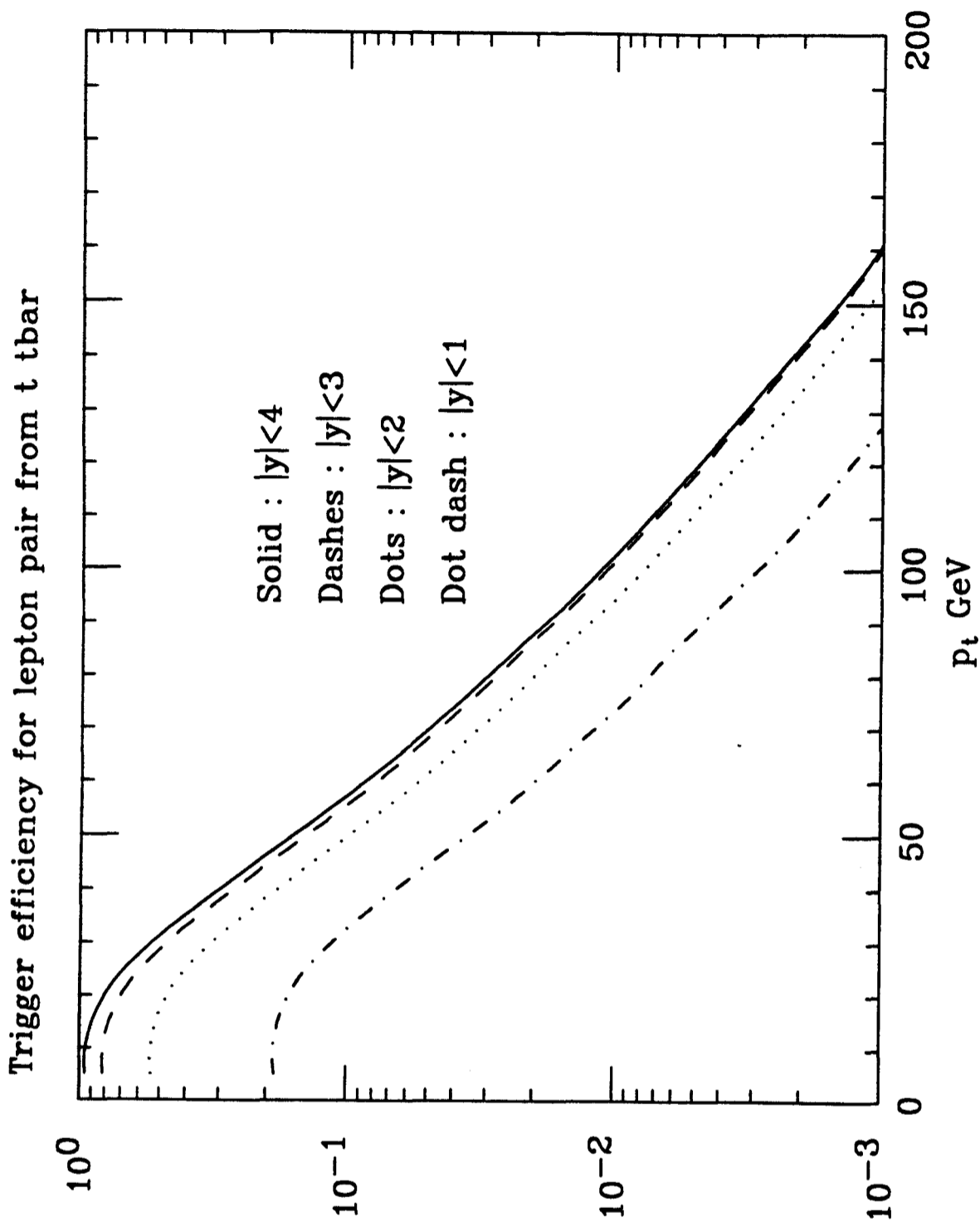


Figure 2

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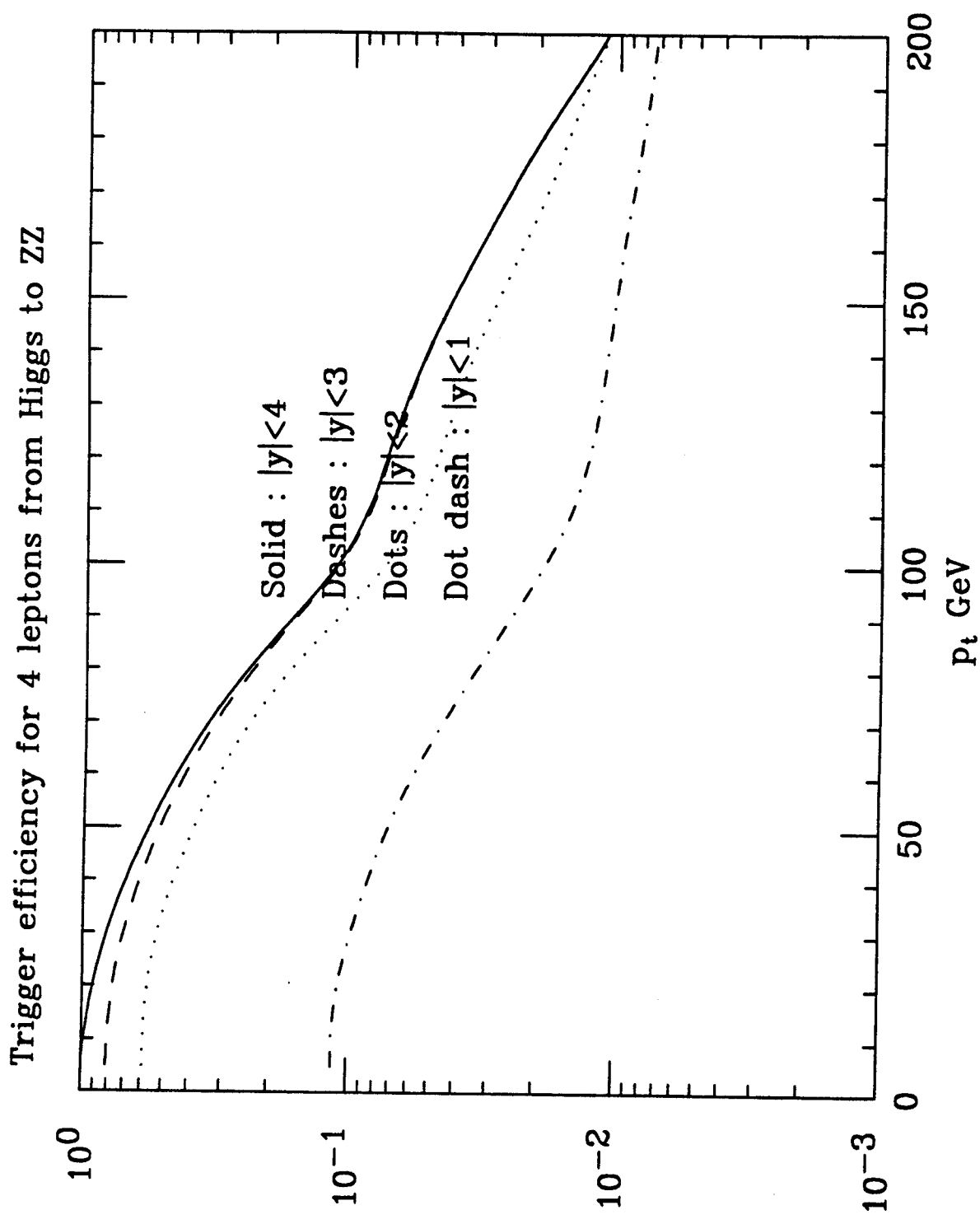


Figure 3

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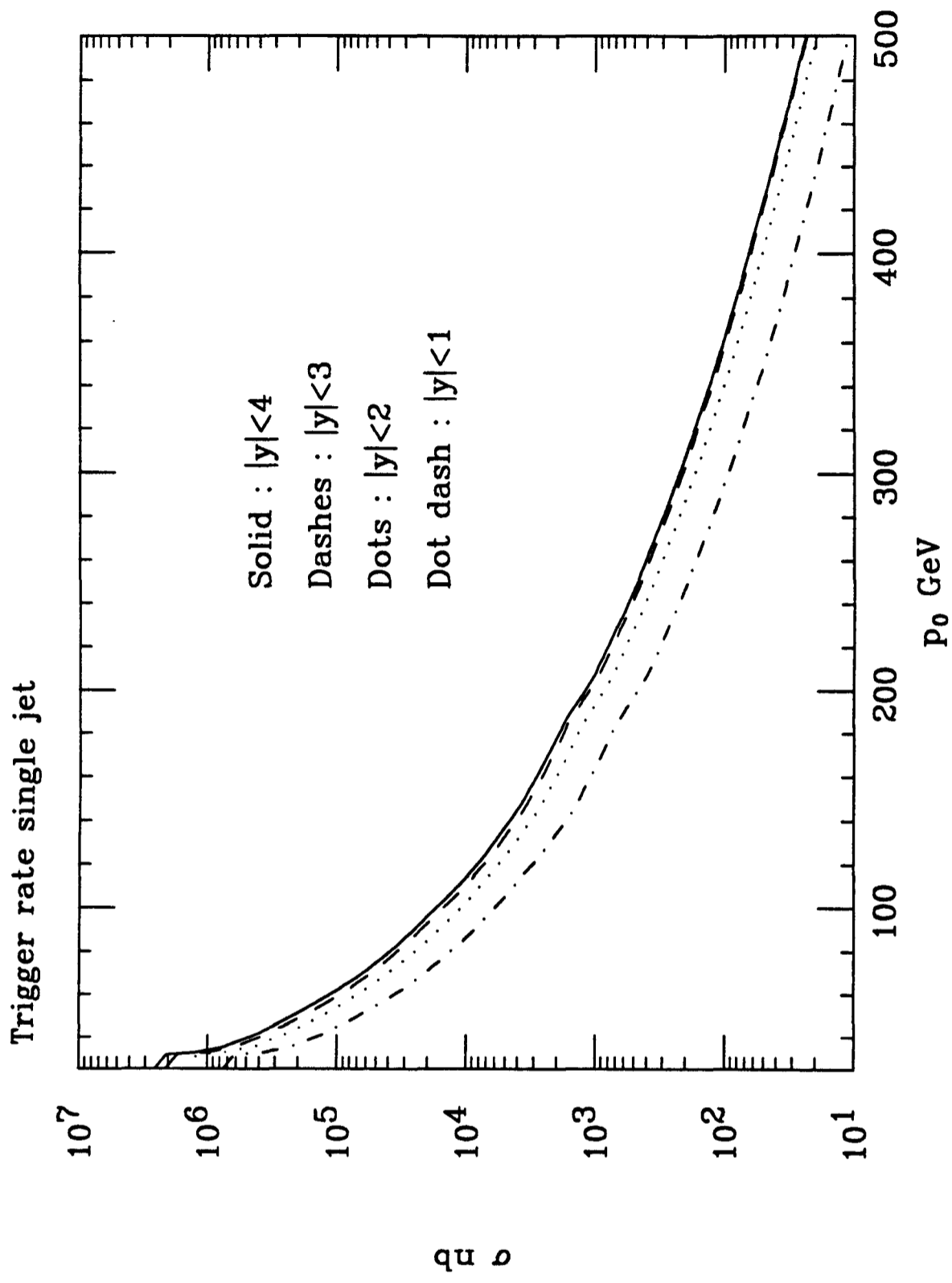


Figure 4

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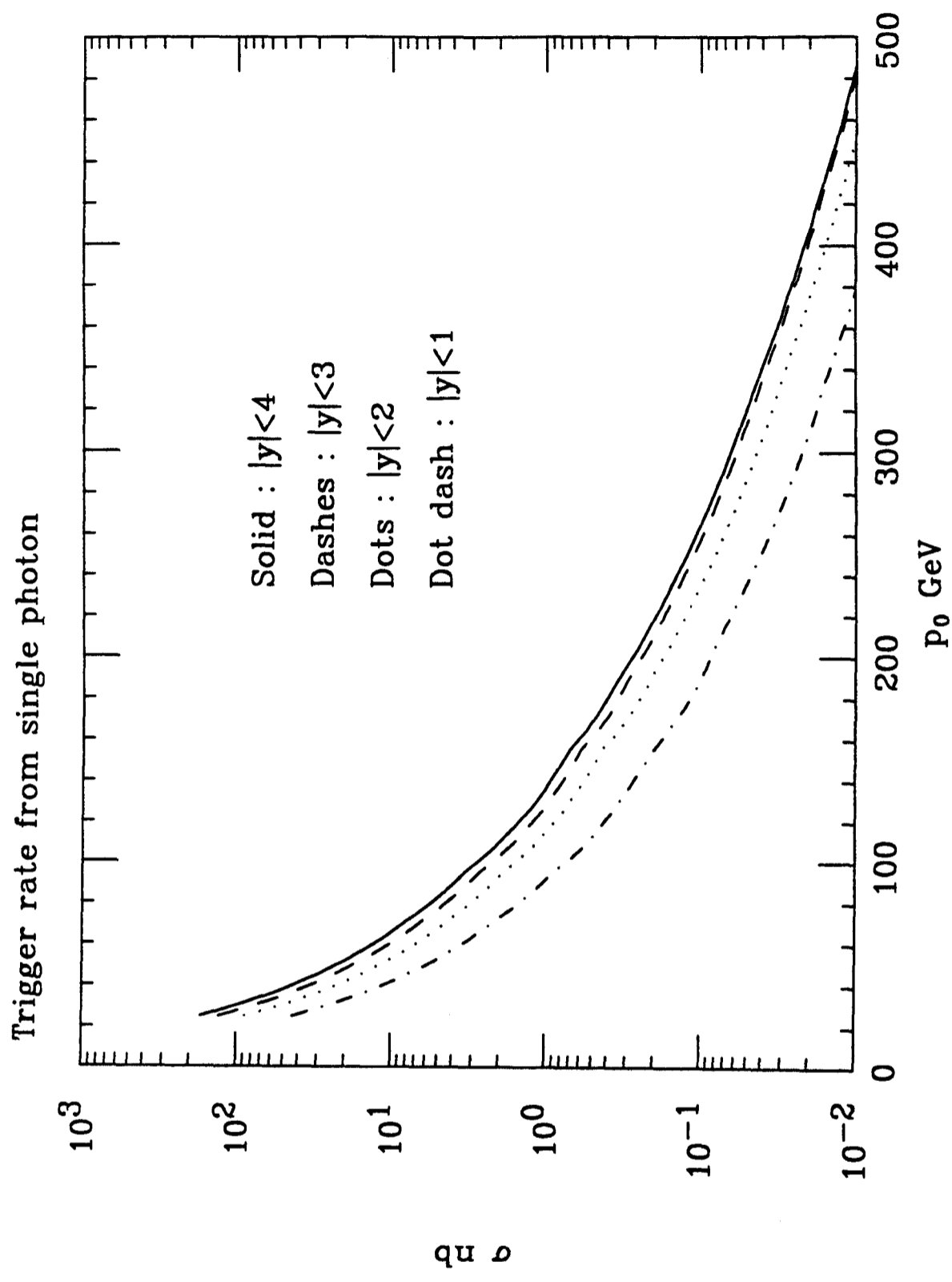


Figure 5

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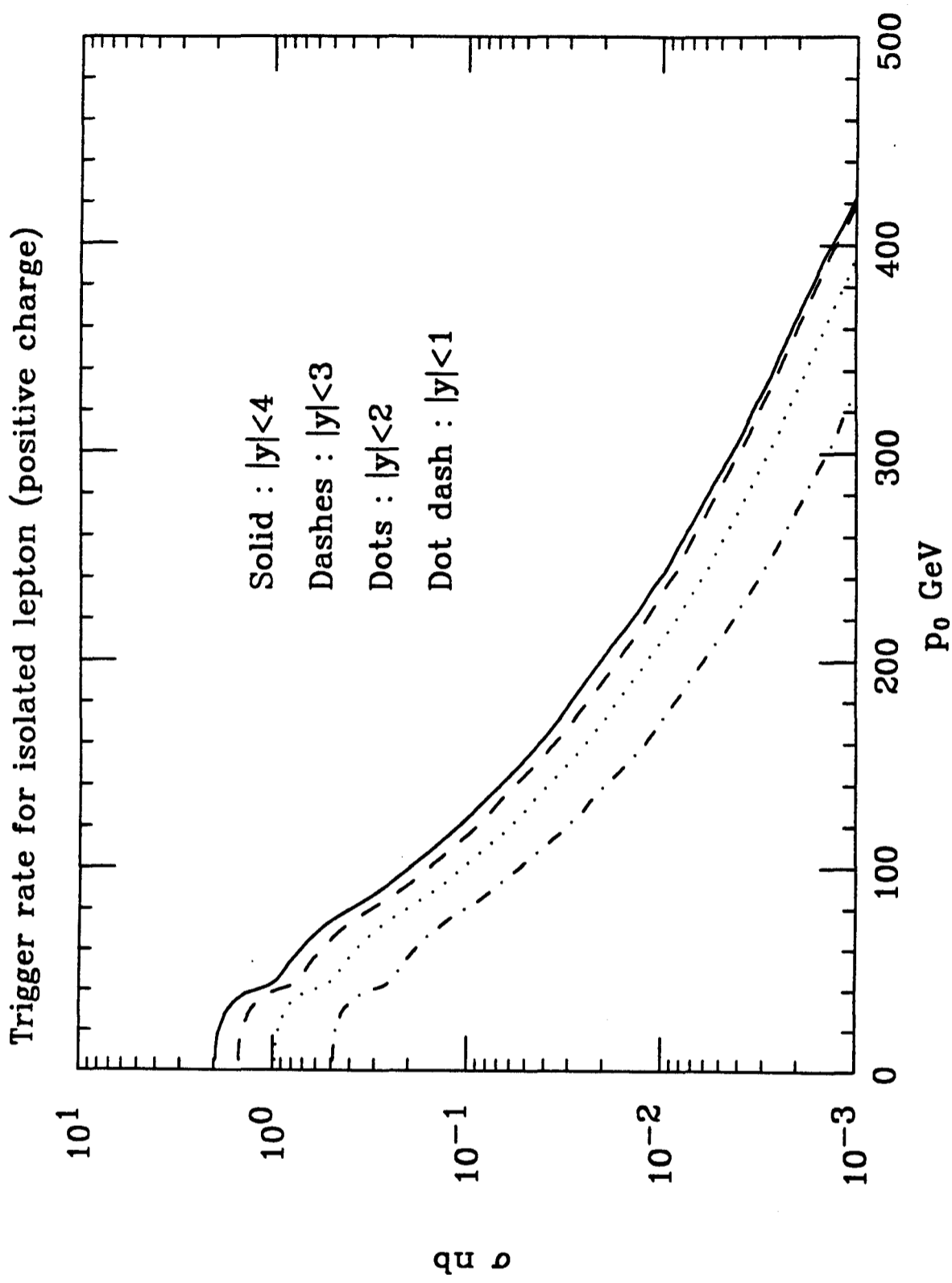


Figure 6

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